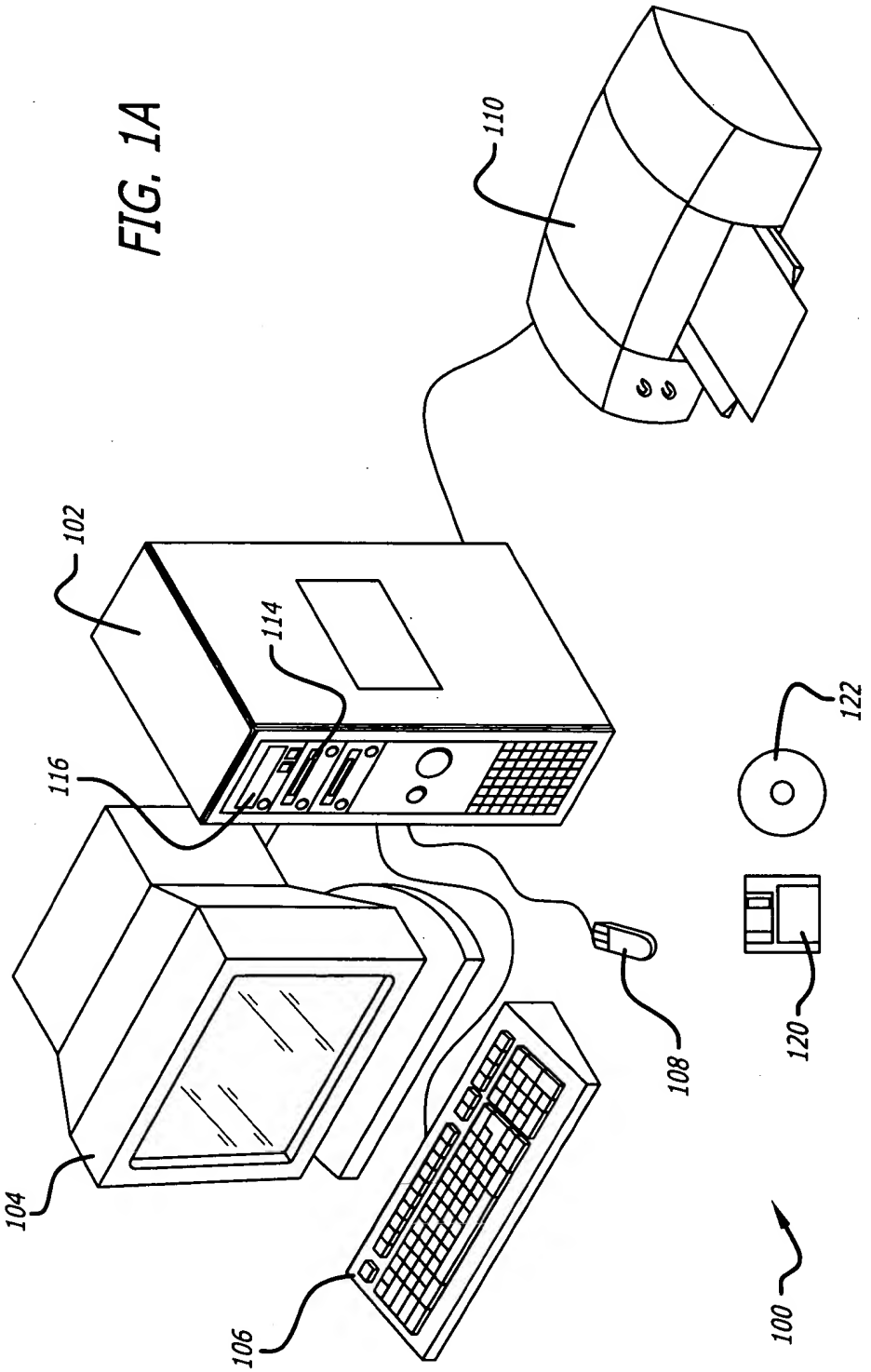
FIG. 1A



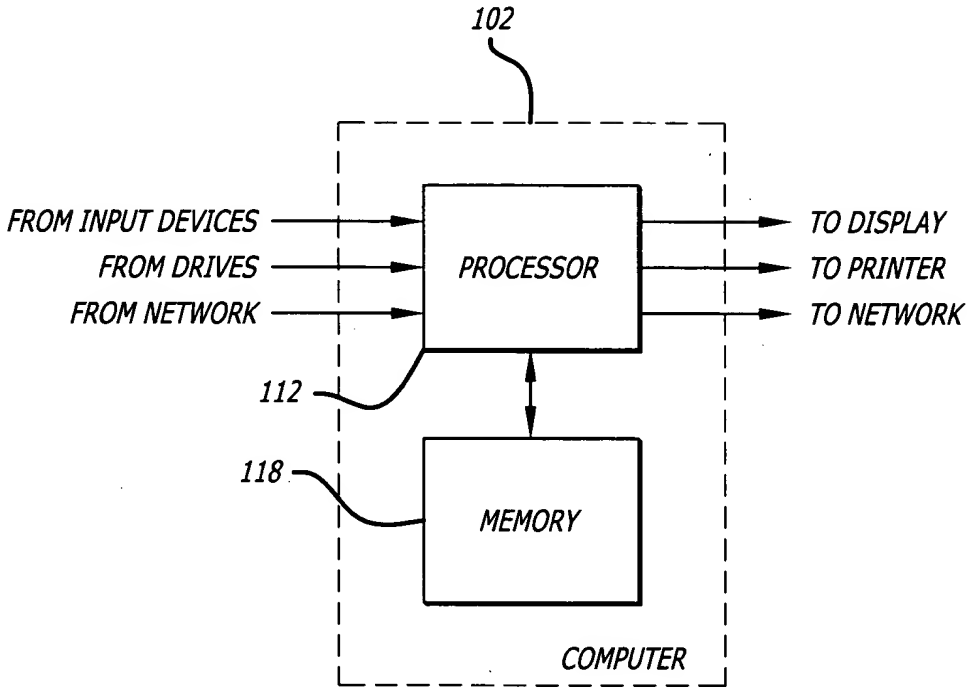

102
FROM INPUT DEVICES
FROM DRIVES
FROM NETWORK
PROCESSOR
TO DISPLAY
TO PRINTER
TO NETWORK
112
118
MEMORY
COMPUTER

FIG. 1B

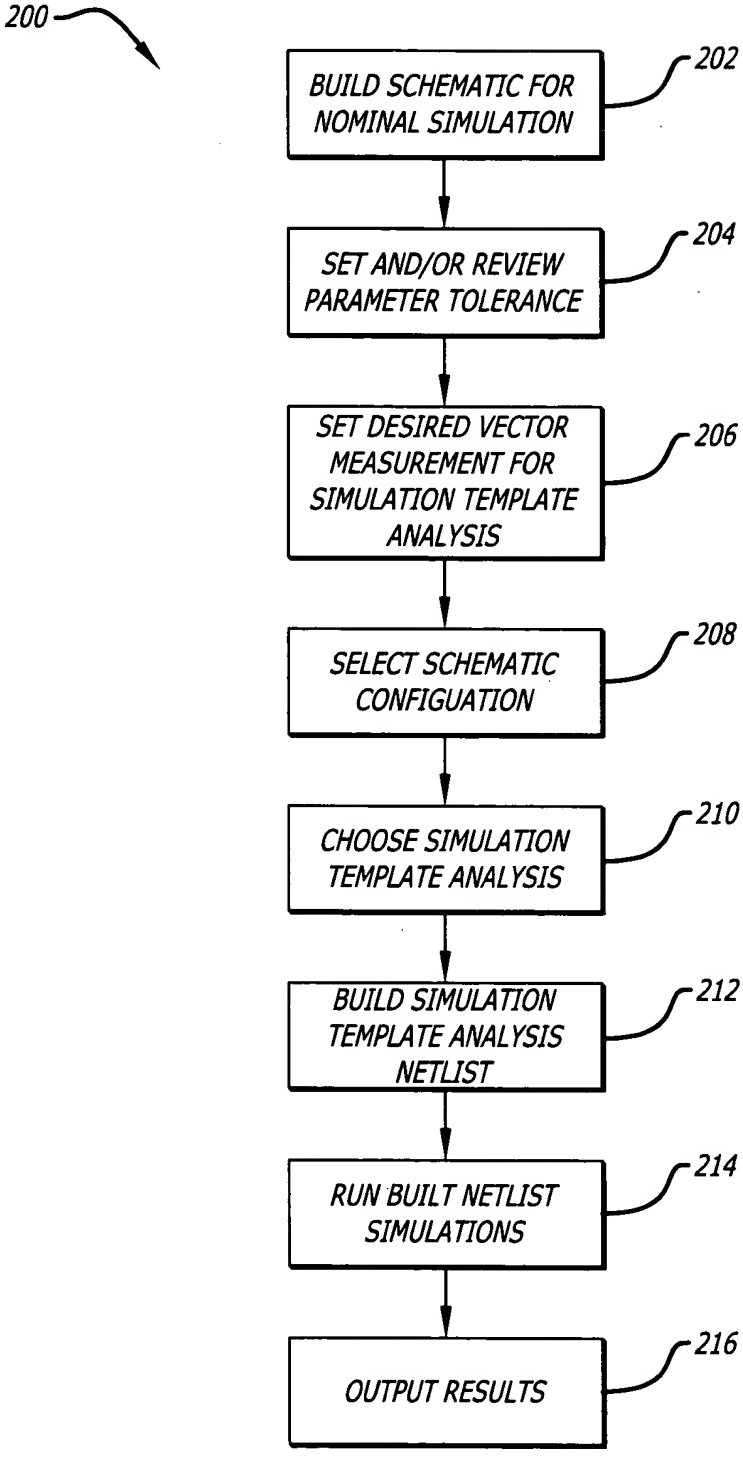

200
BUILD SCHEMATIC FOR NOMINAL SIMULATION
202
SET AND/OR REVIEW PARAMETER TOLERANCE
204
SET DESIRED VECTOR MEASUREMENT FOR SIMULATION TEMPLATE ANALYSIS
206
SELECT SCHEMATIC CONFIGUATION
208
CHOOSE SIMULATION TEMPLATE ANALYSIS
210
BUILD SIMULATION TEMPLATE ANALYSIS NETLIST
212
RUN BUILT NETLIST SIMULATIONS
214
OUTPUT RESULTS
216

FIG. 2

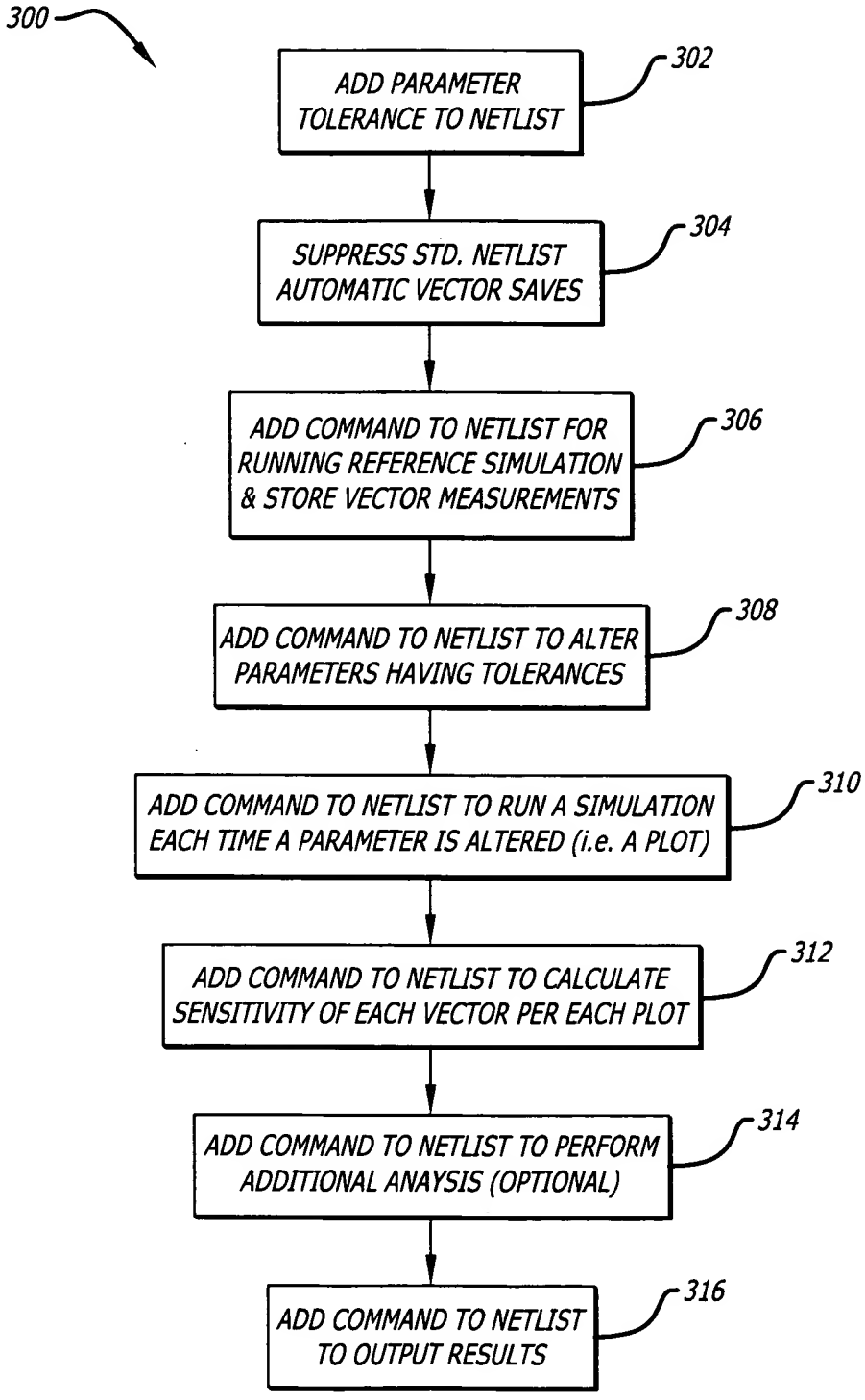

300
ADD PARAMETER TOLERANCE TO NETLIST
302
SUPPRESS STD. NETLIST AUTOMATIC VECTOR SAVES
304
ADD COMMAND TO NETLIST FOR RUNNING REFERENCE SIMULATION & STORE VECTOR MEASUREMENTS
306
ADD COMMAND TO NETLIST TO ALTER PARAMETERS HAVING TOLERANCES
308
ADD COMMAND TO NETLIST TO RUN A SIMULATION EACH TIME A PARAMETER IS ALTERED (i.e. A PLOT)
310
ADD COMMAND TO NETLIST TO CALCULATE SENSITIVITY OF EACH VECTOR PER EACH PLOT
312
ADD COMMAND TO NETLIST TO PERFORM ADDITIONAL ANAYSIS (OPTIONAL)
314
ADD COMMAND TO NETLIST TO OUTPUT RESULTS
316

FIG. 3

SENS, sensitivity analysis Simulation Template With Comments:

```
*Instruct the netlist builder to show tolerances
#tolerance                                                    402

*Suppress automatic vector saves
#nosave                                                       404

*Suppress IsSpice4 printout
#noprint                                                      406

*Save vectors needed for measurements
#vector                                                       408

*Set the output file pointer to the beginning to remove
* the input net list
set rewind                                                    410

*Set the noecho environment for print formatting
set noecho                                                    412

*Run the specified simulation and save the results
#simulation
set printmode = save
#mprint                                                       414

*Rename the simulation plot
nameplot ref                                                  416

*Set the print format
SET COLWIDTH=22
SET SPICEDIGITS=5                                             418

*Tell the user where we are
printstatus -t ########_sensitivity_for_each_parameter_######## 420

*Loop through all of the parameters
nextparam null
while param <> null
  *Alter each parameter
  alterparam tolerance(param)/3
  *Simulate
  #simulation
  Save the parameter reference in the new plot
  paramvec = param
  *Tell the user where we are
  printstatus -p paramvec
  *Save the data                                              422
```

FIG. 4-1

400

FIG. 4-2

```
#mprint
*Loop through the vectors
nv = nextvector(null)
while nv <> null
  *Save the sensitivities of scalar data
  if length(nv) = 1
    nv = nv - ref.nv
  end;  end if
  *Get the next vector
  nv = nextvector(nv)
end ; end vector loop
*Restore the parameter
unalterparam
*Get the next parameter
nextparam
end; end parameter loop
*Set print mode for printing output data
set printmode = print
unset noecho
*Loop through the plots
pl = nextplot(null)
while pl <> null
  if sameplot(ref.default) = 0
    *Loop through the vectors
    nv = nextvector(null)
    while nv <> null
      if length(nv) = 1
        *Save the sensitivities
        if ref.nv <> 0
          nv = (300*NV)/REF.NV
        else
          nv = 3*NV
        end ; end if
      end ; end if
      nv = nextvector(nv)
    end ; end vector loop
  end; end if
  *Get next plot
  pl = nextplot(pl)
end ; end plot loop
*Tell the user what's going on
printstatus -t ########sorting_sensitivity_for_each_parameter_##
printstatus -t
*Make ref the current plot
setplot ref
*Sort by descending value
sort -vd
```

422

424

426

```
*Loop through the plots
pl = nextplot(null)
while pl <> null
  if sameplot(ref.default) = 0
    *Print Headers
    SETPARAM PARAMVEC
    printstatus -p paramvec
    ECHO
    ECHO -u "**********SENSITIVITY DATA**********"
    ECHO
    ECHO -un "PARAMETER NAME: "
    PRINTNAME PARAMVEC
    ECHO
    ECHO -un " NOMINAL VALUE: "
    PRINTVAL  PARAMVEC
    ECHO
    ECHO
    PRINTTEXT -u VECTOR SENSITIVITY%
    ECHO
    ECHO
    *Sort by descending data value
    sort -vd
    *Loop through the vectors and print data
    nv = nextvector(null)
    while nv <> null
      if length(nv) = 1
        if ref.nv <> 0
          PRINTNAME NV
          PRINTVAL NV
        else
          PRINTNAME NV
          PRINTVAL NV
          ECHO -n *
        end ; end if
        ECHO
      end ; end if
      *Get next vector
      nv = nextvector(nv)
    end; end vector loop
  end ; end if
  *Get next plot
  pl = nextplot(pl)
end; end plot loop
ECHO
ECHO
*Print data in output file for SpiceNet to read
setplot ref
echo ########## SENSITIVITY analysis Results ############
#mprint
```

428

430

FIG. 4-3

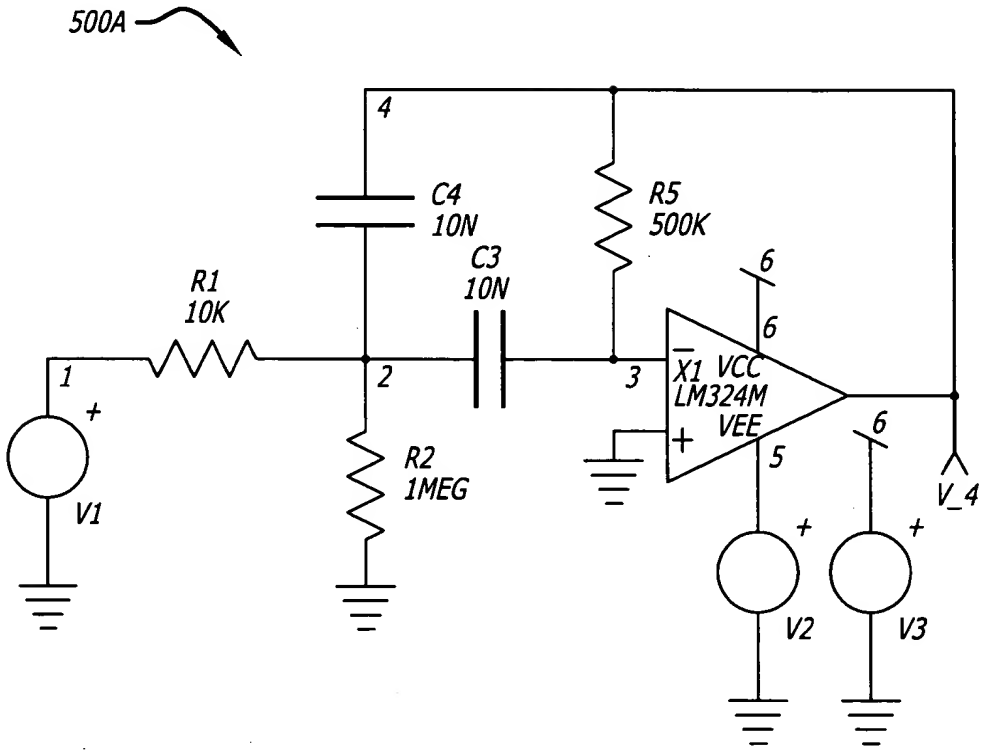


FIG. 5A

500B

```
C:\spice8d\Circuits\Bandpass.cir Setup1
*#save V(2) V(3) @C3[i] @C3[p] V(1) @R1[i] @R1[p] V(4)
*#save @C4[i] @C4[p] @R2[i] @R2[p] @R5[i] @R5[p] V(6) V(5)
*#save @V1[i] @V1[p] @V2[i] @V2[p] @V3[i] @V3[p]
*#alias v_4 v(4)
*#view tran v_4
.TRAN .05ms 20ms
.PRINT AC VDB(4)
.OPTIONS vscale=4
.PRINT TRAN V 4
```

502

504

506

FIG. 5B-1

```
C3 2 3 10N
R1 1 2 10K
C4 2 4 10N
R2 2 0 1MEG
R5 3 4 500K
X1 0 3 6 5 4 LM324M { }
.SUBCKT LM324M  1 2 3 4 5
*
C1   11 12 3.000E-12
C2   6  7 6.000E-12
CEE  10 99 315.8E-15
DC   5 53 DX
DE   54  5 DX
DLP  90 91 DX
DLN  92 90 DX
DP   4  3 DX
EGND 99  0 POLY(2) 3 0  4 0  0 .5 .5
FB   7 99 POLY(5) VB VC VE VLP VLN 0 53.05E6
+ -50E6 50E6 50E6 -50E6
GA   6  0 11 12 37.70E-6
GCM  0  6 10 99 11.92E-9
IEE  3 10 DC 2.476E-6
HLIM 90  0 VLIM 1K
Q1   11  2 13 QX
Q2   12  1 14 QX
R2   6  9 100.0E3
RC1  4 11 26.53E3
RC2  4 12 26.53E3
RE1  13 10 4.820E3
RE2  14 10 4.820E3
REE  10 99 80.78E6
RO1  8  5 50
RO2  7 99 50
RP   3  4 34.71E3
VB   9  0 DC 0
VC   3 53 DC 2
VE   54  4 DC 5.000E-3
VLIM 7  8 DC 0
VLP  91  0 DC 40
VLN  0 92 DC 40
.MODEL DX D(IS=800.0E-18)
.MODEL QX PNP(IS=800.0E-18 BF=31.58)
.ENDS
V1 1 0 AC=1 PULSE 0 -1 1MS
V2 5 0 DC=-5
V3 6 0 DC=5
.END
```

508

FIG. 5B-2

500B

```
C:\spice8d\Circuits\Bandpass.cir Setup1
.OPTIONS vscale=4
.control
alias v_4 v(4)
view tran v_4
save v(4)                                   608

set rewind                                  610
set noecho                                  612
TRAN .05ms 20ms

set printmode = save
echo TRAN Analysis Measurements             614
echo
echo Test 1 Mean
homeCursors
print  Mean(V(4))

nameplot ref                                616

SET COLWIDTH=22                             618
SET SPICEDIGITS=5

printstatus -t ########_sensitivity_for_each_parameter_########   620
nextparam null
while param <> null
  alterparam tolerance(param)/3
  TRAN .05ms 20ms

  paramvec = param
  printstatus -p paramvec
  echo TRAN Analysis Measurements
echo                                        622
echo Test 1 Mean
homeCursors
print  Mean(V(4))

  nv = nextvector(null)
  while nv <> null
  if length(nv) = 1
     nv = nv - ref.nv
     end
  nv = nextvector(nv)
  end
  unalterparam
  nextparam
end
```

FIG. 6-1

600

```
set printmode = print
unset noecho

pl = nextplot(null)
while pl <> null
  if sameplot(ref.default) = 0

    nv = nextvector(null)

    while nv <> null
      if length(nv) = 1
        if ref.nv <> 0
          nv = (300*NV)/REF.NV
        else
          nv = 3*NV
        end
      end
      nv = nextvector(nv)
    end
  end
  pl = nextplot(pl)
end
```

624

FIG. 6-2

```
printstatus -t ########sorting_sensitivity_for_each_parameter_########
printstatus -t

setplot ref
sort -vd

pl = nextplot(null)
while pl <> null
  if sameplot(ref.default) = 0

    SETPARAM PARAMVEC

    printstatus -p paramvec

    ECHO
    ECHO -u "**********SENSITIVITY DATA**********"
    ECHO
    ECHO -un "PARAMETER NAME: "
    PRINTNAME PARAMVEC
    ECHO
    ECHO -un " NOMINAL VALUE: "
    PRINTVAL  PARAMVEC
    ECHO
    ECHO
```

626

628

```
PRINTTEXT -u VECTOR SENSITIVITY%
ECHO
ECHO

sort -vd
nv = nextvector(null)

while nv <> null
    if length(nv) = 1
        if ref.nv <> 0
            PRINTNAME NV
            PRINTVAL NV
        else
            PRINTNAME NV
            PRINTVAL NV
            ECHO -n *
        end
        ECHO
    end
    nv = nextvector(nv)
end

  end
  pl = nextplot(pl)
end

ECHO
ECHO

setplot ref
echo ########## SENSITIVITY analysis Results ############
echo TRAN Analysis Measurements
echo
echo Test 1 Mean
homeCursors
print  Mean(V(4))


.endc
C3 2 3 10N TOL=5%
R1 1 2 10K TOL=2%
C4 2 4 10N TOL=5%
R2 2 0 1MEG TOL=2%
R5 3 4 500K TOL=2%
X1 0 3 6 5 4 LM324M { }
```

628

630

632

FIG. 6-3

FIG. 6-4

```
.SUBCKT LM324M  1 2 3 4 5
*
C1   11 12 3.000E-12
C2   6  7 6.000E-12
CEE  10 99 315.8E-15
DC   5 53 DX
DE   54  5 DX
DLP  90 91 DX
DLN  92 90 DX
DP   4  3 DX
EGND 99  0 POLY(2) 3 0  4 0  0 .5 .5
FB   7 99 POLY(5) VB VC VE VLP VLN 0 53.05E6
+ -50E6 50E6 50E6 -50E6
GA   6  0 11 12 37.70E-6
GCM  0  6 10 99 11.92E-9
IEE  3 10 DC 2.476E-6
HLIM 90  0 VLIM 1K
Q1   11  2 13 QX
Q2   12  1 14 QX
R2   6  9 100.0E3
RC1  4 11 26.53E3
RC2  4 12 26.53E3
RE1  13 10 4.820E3
RE2  14 10 4.820E3
REE  10 99 80.78E6
RO1  8  5 50
RO2  7 99 50
RP   3  4 34.71E3
VB   9  0 DC 0
VC   3 53 DC 2
VE   54  4 DC 5.000E-3
VLIM 7  8 DC 0
VLP  91  0 DC 40
VLN  0 92 DC 40
.MODEL DX D(IS=800.0E-18)
.MODEL QX PNP(IS=800.0E-18 BF=31.58)
.ENDS
V1 1 0 AC=1 PULSE 0 -1 1MS
V2 5 0 DC=-5
V3 6 0 DC=5
.END
```

632

FIG. 7

700

**********SENSITIVITY DATA**********
PARAMETER NAME: r5
NOMINAL VALUE: 500.00K

VECTOR	SENSITIVITY%
mean(v(4))	1.5111

**********SENSITIVITY DATA**********
PARAMETER NAME: r2
NOMINAL VALUE: 1.0000Meg

VECTOR	SENSITIVITY%
mean(v(4))	17.265M

**********SENSITIVITY DATA**********
PARAMETER NAME: c4
NOMINAL VALUE: 10.0000N

VECTOR	SENSITIVITY%
mean(v(4))	-752.77M

**********SENSITIVITY DATA**********
PARAMETER NAME: r1
NOMINAL VALUE: 10.0000K

VECTOR	SENSITIVITY%
mean(v(4))	-571.46M

**********SENSITIVITY DATA**********
PARAMETER NAME: c3
NOMINAL VALUE: 10.0000N

VECTOR	SENSITIVITY%
mean(v(4))	4.5201

########## sensitivity analysis results ##########
tran analysis measurements

test 1 mean
mean(v(4)) = 2.086052e-001

Total run time: 0.583 seconds.

Total run time: 0.583 seconds.

Memory remaining = 1996210 Kbytes
Memory Used = 14401 Kbytes

RSS, root summed square analysis Simulation Template With Comments:

FIG. 8-1

```
*Instruct the netlist builder to show tolerances                    802
#tolerance

*Suppress automatic vector saves                                    804
#nosave

*Suppress IsSpice4 printout                                         806
#noprint

*Save vectors needed for measurements                               808
#vector

*Set the output file pointer to the beginning to remove             810
* the input net list
set rewind

*Set the noecho environment for print formatting                    812
set noecho

*Run the specified simulation and save the results                  814
#simulation
set printmode = save
#mprint

*Set the print format                                               818
SET COLWIDTH=22
SET SPICEDIGITS=5

*Rename the simulation plot                                         816
nameplot ref

*Loop through all of the parameters                                 822
nextparam null
*Tell the user where we are
printstatus -t "######## sensitivity for each parameter ########"  820
while param <> null
  *Alter each parameter
  alterparam tolerance(param)/3
  *Simulate
  #simulation
  *Save the parameter reference in the new plot
  paramvec = param
  *Tell the user where we are
  printstatus -p paramvec
  *Save the data
  #mprint
```

800

```
*Loop through the vectors
nv = nextvector(null)
while nv <> null
   *Save the sensitivities of scalar data
   if length(nv) = 1
        nv = nv - ref.nv
   end ; end if
   *Get the next vector
   nv = nextvector(nv)
end ; end vector loop
*Restore the parameter
unalterparam
*Get the next parameter
nextparam
end ; end parameter loop
*Set print mode for printing output data
set printmode = print
unset noecho
*Make a new plot for rss data and make it the current plot
newplot rss ref.default ref.default
setplot rss
*Loop through the vectors
nv = nextvector(null)
while nv <> null
   *Initialize the scalar data to zero
   IF LENGTH(NV) = 1
      nv = 0
   END ; end if
   * Get the next vector
   nv = nextvector(nv)
end ; end vector loop
*Loop through the plots
pl = nextplot(null)
*Tell the user where we are
printstatus -t "######## computing rss for each measurement ########"
while pl <> null
   *Select plots
   if sameplot(rss.default) = 0
      if sameplot(ref.default) = 0
           *Tell the user what we are doing
           printstatus -l pl
           *Make the saved parameter reference, paramvec current
           SETPARAM PARAMVEC
           *Get the next vector
           nv = nextvector(null)
           *Print formatted data
           ECHO
```

822

824

832

826'

828'

FIG. 8-2

```
ECHO -U "**********RSS DATA**********"
        ECHO
        ECHO -UN " PARAMETER NAME: "
        PRINTNAME PARAMVEC
        ECHO
        ECHO -UN "  NOMINAL VALUE: "
        PRINTVAL  PARAMVEC
        ECHO
        ECHO -UN "TOLERANCE VALUE: "
        PRINTTOL  PARAMVEC
        ECHO
        ECHO
        PRINTTEXT -UN VECTOR
        PRINTTEXT -U SENSITIVITY% RSS_CONTRIBUTION
        ECHO
        ECHO
        *Loop through vectors
        while nv <> null
          if length(nv) = 1
            IF REF.NV <> 0
              *Calculate the RSS percentage if value is not zero
              PRINTNAME NV
              NEWNV = (300*NV)/REF.NV
              PRINTVAL NEWNV
            ELSE
              *Calculate the RSS  if value is not zero
              PRINTNAME NV
              NEWNV = 3*NV
              PRINTVAL NEWNV
              ECHO -N *
            END ;end if
            *Save and print the sum of squares
            rss.nv = rss.nv + nv * nv
            PRINTVAL RSS.NV
            ECHO
          end ;end if
          * Get next vector
          nv = nextvector(nv)
        end ;end vector loop
        * Sort plot by descending value
        sort -vd
      end ;end if
    end ;end if
    * Get next plot
    pl = nextplot(pl)
end ;end plot loop
```

828'

FIG. 8-3

```
*Sort the rss plot by descending value
setplot rss
SORT -VD
*Print Headers
ECHO
ECHO -U "**********RSS HI/LO ANALYSIS RESULTS**********"
ECHO
PRINTTEXT -UN VECTOR
SET COLWIDTH=15
PRINTTEXT -U NOMINAL RSS-VALUE TOLERANCE% HI_VALUE LO_VALUE
ECHO
ECHO
*Make a new plot for results
newplot hirss ref.default ref.default
*Loop through the vectors
nv = nextvector(null)
while nv <> null
    if length(nv) = 1
        *Print formatted data
        SET COLWIDTH=22
            PRINTNAME NV
        SET COLWIDTH=15
        PRINTVAL REF.NV
            NV = 3 * SQRT(ABS(NV))
        PRINTVAL NV
            IF REF.NV <> 0
            NEWNV = (100*NV)/REF.NV
        ELSE
            NEWNV = NV*0
        END
        PRINTVAL NEWNV
            NV = REF.NV + NV
        HI_RSS = REF.NV + NV
        LO_RSS = REF.NV - NV
        PRINTVAL HI_RSS
        PRINTVAL LO_RSS
        ECHO
    end ; end if
    *Get next vector
    nv = nextvector(nv)
end; end vector loop
ECHO
ECHO
*Print data in output file for SpiceNet to read
setplot rss
echo ########## RSS HI analysis Results ##############
#mprint
RUSAGE ELAPSED
```

834

830'

FIG. 8-4

EVA, Extreme Value Analysis Simulation Template With Comments:

```
*Instruct the netlist builder to show tolerances
#tolerance                                              902

*Suppress automatic vector saves
#nosave                                                 904

*Suppress IsSpice4 printout
#noprint                                                906

*Save vectors needed for measurements
#vector                                                 908

Set the noecho environment for print formatting
set rewind                                              910
set noecho                                              912

*Run the specified simulation and save the results
#simulation
pltype = 0 ;Identify the plot type for later use        914'
set printmode = save
#mprint

*Set the print format
SET COLWIDTH=22                                         918
SET SPICEDIGITS=5
nameplot ref                                            916
newplot evahi ref.default ref.default
evahi.pltype = 0 ;Identify the plot type for later use  932
*Print status for the user
printstatus -t "######## sensitivity for each parameter ########"   920
*Loop through the parameters
nextparam null
while param <> null
  *Alter each parameter
  alterparam tolerance(param)/3
  *Simulate, making a new plot for results
  #simulation
  *Save the current parameter reference                 922'
  paramvec = param
  *Tell the user where we are
  printstatus -p paramvec
 *Save the tol and paramval
  paramtol = tolerance(param)
  paramval = getparam(param)
  pltype = 1 ;Identify the plot type for later use
 *Save the simulation results
```

FIG. 9-1

900

```
#mprint
*Loop through all the vectors
nv = nextvector(null)
while nv <> null
  *Save the sensitivities for all scalar measurements except pltype
  if length(nv) = 1
    if nv <> pltype
      nv = nv - ref.nv
    end ;end if
  end ;end if
  nv = nextvector(nv)
end ;end vector loop
*Restore the param
unalterparam
*Get the next param
nextparam
end;end parameter loop
*Make ref the current plot
setplot ref
*Loop through the vectors in ref
nv = nextvector(null)
*Tell the user where we are
printstatus -t "######## measurements ########"
while nv <> null
  if length(nv) = 1
    *Loop through all the plots containing scalar vectors
    pl = nextplot(null)
    while pl <> null
      if pltype = 1
* the inner loop, we are looping through each sensitivity plot looking at the same vector
* we will alter the parameter id'd by paramvec to maximize/minimize the vector
        setparam paramvec
        *Change each parameter to its worst case extreme value
        if nv >= 0
          alterparam paramtol
        else
          alterparam -paramtol
        end
      end
      pl = nextplot(pl)
    end
    *Simulate for the extreme case and save the data in a new plot
    #simulation
    #mprint
    pltype = 2 ;Identify the plot type for later use
* if we want sensitivity at the extreme, we need to go through each param
* and change it to be a bit different than it is at the extreme, run a simulation ,
```

922'

934

FIG. 9-2

```
* and mark it as pltype 3 along with its paramvec, then we can take the diff
* from the pltype = 2 to get the sensitivity at the extreme if the sign at the extreme
* is different than at the nominal, we can report an error or go on to do worst case
* for worst case, we need to reduce the param change by 1/2 and do this over again...
* either continue in this loop or make a wc loop afterward... save the paramvalue
* and tolerance
      evahi.nv = nv
      if nv <> pltype
        *Tell the user where we are
        printstatus -n nv
      end ;endif
    end ;end plot loop
    ;get the next vector
    nv = nextvector(nv)
end ;end vector loop
*Set print mode and print header
set printmode = print
unset noecho
setplot EVAHI
ECHO
ECHO -U "**********EVA PARAMETER LIST**********"
ECHO
PRINTTEXT -UN PARAMETER
PRINTTEXT -U NOMINAL TOLERANCE
ECHO
ECHO
*Loop through the parameters
nextparam null
while param <> null
    *Extract the saved param reference and print its data
   paramvec = param
   PRINTNAME PARAMVEC
   PRINTVAL  PARAMVEC
   PRINTTOL  PARAMVEC
   ECHO
   *get the next param
   nextparam
end ;end param loop
ECHO ;print a blank line
*Make a new plot to hold sorted results
newplot evasort ref.default ref.default
*Make ref the current plot
setplot REF
*Loop through all vectors in ref
nv = nextvector(null)
while nv <> null
   if length(nv) = 1
```

934

936

938

FIG. 9-3

```
    *save the result in evasort as a percent of its value
    if ref.nv <> 0
      evasort.nv = ((evahi.nv-ref.nv)*100)/ref.nv
    else
      evasort.nv = 0;
    end ;end if
  end ;end if
  *Get the next vector
  nv = nextvector(nv)
end ;end vector loop
*Print some headers
ECHO
ECHO -U "**********EVA-HI RESULTS**********"
ECHO
PRINTTEXT -UN VECTOR
PRINTTEXT -U NOMINAL EVA-HI CHANGE%
ECHO
ECHO
setplot evasort
*Sort evasort by descanting data
sort -VD
*Loop through the vectors
nv = nextvector(null)
while nv <> null
  *If its the correct data in the correct plot, print it
  if length(nv) = 1
    if nv <> pltype
      PRINTNAME NV
      PRINTVAL  REF.NV
      PRINTVAL  EVAHI.NV
      PRINTVAL  EVASORT.NV
      ECHO
    end ; end if
  end ; end if
  *Get the next vector
  nv = nextvector(nv)
end ; end vector loop
ECHO
ECHO

* now the eva results are in pltype = 2 plots
*Print the results so SpiceNet can read the eva-hi data
set printmode = print
unset noecho
setplot evahi
echo ########## EVA HI analysis Results #############
#mprint
```

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FIG. 9-4

WCS, Worst Case by Sensitivity Simulation Template With Comments:

```
*Instruct the netlist builder to show tolerances                    1002
#tolerance

*Suppress automatic vector saves                                    1004
#nosave

*Suppress IsSpice4 printout                                         1006
#noprint

*Save vectors needed for measurements                               1008
#vector

*Set the output file pointer to the beginning to remove             1010
* the input net list
set rewind

*Set the noecho environment for print formatting                    1012
set noecho

*Run the specified simulation and save the results                  1014
#simulation
set printmode = save
#mprint

*Set the print format                                               1018
SET COLWIDTH=22
SET SPICEDIGITS=5

*Rename the simulation plot                                         1016
nameplot ref

*Make a newplot for results                                         1032
newplot result ref.default ref.default

*Set the current plot to ref                                        1034
setplot ref

*Print status for the user                                          1020
printstatus -t "######## sensitivity for each parameter ########"

*Loop through the parameters                                        1022'
nextparam null
while param <> null
  *Alter each parameter
  alterparam tolerance(param)/3
  *Simulate, making a new plot for results
      #simulation
  *Save the current parameter reference
```

FIG. 10-1

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```
        paramvec = param
    *Inform the user about what's being done
        printstatus -p paramvec
    *Make and save the measurements
    #mprint
    *Loop through the vectors
    nv = nextvector(null)
      while nv <> null
      *Save the sensitivity of scalar quantities
      if length(nv) = 1
          nv = nv - ref.nv
          *Save the worst case -hi value
          result.nv = result.nv + abs(3*nv)
      end ;end if
      nv = nextvector(nv)
    end ;end vector loop
    *restore the parameter value
    unalterparam
    *get the next parameter
    nextparam
end ;end parameter loop
```

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FIG. 10-2

```
*Set the print mode to print instead of save
set printmode = print
*Restore the echo mode for printing
unset noecho
*Set result to the current plot
setplot result
*Print the header
ECHO
ECHO -U "**********WCS PARAMETER LIST**********"
ECHO
PRINTTEXT -UN PARAMETER
PRINTTEXT -U NOMINAL TOLERANCE
ECHO
ECHO
*Loop through the parameters
nextparam null
while param <> null
      paramvec = param
          *Print the row
          PRINTNAME PARAMVEC
          PRINTVAL  PARAMVEC
          PRINTTOL  PARAMVEC
    ECHO
    nextparam
end
ECHO
```

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FIG. 10-3

```
*Make a new plot to hold sorted results
newplot wcsort ref.default ref.default
*Set the current plot to ref
setplot REF
*Loop through its vectors
nv = nextvector(null)
while nv <> null
  *Calculate the wc as a percent change results
  if length(nv) = 1
    if ref.nv <> 0
      wcsort.nv = ((result.nv-ref.nv)*100)/ref.nv
    else
      wcsort.nv = 0;
    end ;end if
  end ;end if
    nv = nextvector(nv)
end ;end vector loop
*Print headers
ECHO
ECHO -U "**********WCS-HI RESULTS**********"
ECHO
PRINTTEXT -UN VECTOR
PRINTTEXT -U NOMINAL WCS-HI CHANGE%
ECHO
ECHO
;sort wcsort by descending value
setplot wcsort
sort -VD
*Print the ordered list
nv = nextvector(null)
while nv <> null
  if length(nv) = 1
    PRINTNAME NV
    PRINTVAL  REF.NV
    PRINTVAL  RESULT.NV
    PRINTVAL  WCSORT.NV
    ECHO
  end
    nv = nextvector(nv)
end
ECHO
ECHO
*Set the current plot to the wc results
setplot result
echo ########## WCS HI analysis Results ##############
*Print the measured results in a form that can be read back into SpiceNet
#mprint
*Report the elapsed time in the output file
rusage elapsed
```

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